

WHAT IS CLAIMED IS:

1. A tubular film, wherein a thermoplastic sheet film is wound so that leading and trailing ends of said sheet film partially overlap each other to form overlapping portions, and the overlapping portions are connected by heating said wound sheet film for a predetermined time.
2. The film according to claim 1, wherein said sheet film is wound a plurality of number of times and formed into a tubular film by overlaying and welding the leading and trailing ends of said film on each other.
3. The film according to claim 1, wherein when the leading and trailing ends of said film are overlayed on each other to form overlapping portions, the overlapping portions coil on a surface of a spirally wound tubular film.
4. The film according to claim 1, wherein said film is formed into a tubular film by obliquely cutting the two ends of said film and overlaying the two ends on each other so that the overlapping portions are spirally formed.
5. The film according to claim 4, wherein said sheet film is wound a plurality of number of times and the leading and trailing ends are overlayed on each other to form a wound body.

6. A tubular film, wherein a first thermoplastic sheet film is wound so that leading and trailing ends form overlapping portions, and a second thermoplastic sheet film is wound on said first sheet film so that
- 5 leading and trailing ends form overlapping portions, thereby forming a tubular body from said first and second sheet films, and

the overlapping portions of said first and second sheet films are connected by heating said tubular body.

- 10 7. The film according to claim 6, wherein an adhesive is coated on a surface of said first layer in contact with said second layer.

8. A tubular film, wherein a thermoplastic sheet film is wound to form a wound body so that leading and
- 15 trailing ends of said film overlap each other, and said wound body is covered with a thermoplastic tube and heated, thereby connecting the overlapping portions of the leading and trailing ends and forming a tubular body.

- 20 9. The film according to claim 7, wherein an adhesive is coated on a surface of said first layer in contact with said second layer.

10. A tubular film, wherein a thermoplastic sheet film is wound on a non-thermoplastic tube, leading and
- 25 trailing ends of said film are partially overlaid on each other to form a multilayered tubular body, and

said tubular body is heated to connect the overlapping portions.

11. The film according to claim 10, wherein an adhesive is coated on a surface of said first layer in contact with said second layer.

12. The film according to claim 10, wherein said tubular body is cooled to a predetermined temperature after heated for a predetermined time.

13. The film according to claim 12, wherein said sheet film is made from a crystalline thermoplastic material.

14. A multilayered tubular body, wherein a non-thermoplastic tube and a thermoplastic tube are overlayed on each other to form a multilayered tubular body, and said multilayered tubular body is heated.

15. The tubular body according to claim 12, wherein a primer is coated on an outer circumferential surface of said non-thermoplastic tube or on an inner circumferential surface of said thermoplastic tube.

16. A method of manufacturing a tubular film, comprising the steps of:

winding a thermoplastic sheet film on a columnar member, overlaying leading and trailing ends of said film on each other, and fitting a tubular molding member on said wound film; and

connecting the overlapping portions of said film by heating at least said film, thereby forming said sheet film into a tubular film.

17. The method according to claim 16, wherein said  
5 film and said columnar member fitted in said tubular molding member are cooled to a predetermined temperature after heated.

18. The method according to claim 16, wherein a  
10 thermal expansion coefficient of a material of said columnar member is larger than a thermal expansion coefficient of a material of said tubular molding member.

19. The method according to claim 18, wherein a  
15 difference between the thermal expansion coefficients of the materials of said columnar member and said tubular molding member is not less than  $1 \times 10^{-7}$  (/°C).

20. The method according to claim 16, wherein a  
difference between an inner diameter of said tubular molding member and an outer diameter of said columnar  
20 member is twice as large as a desired thickness of a tubular film at a temperature necessary for heat-welding of said sheet film.

21. The method according to claim 16, wherein a  
material of said columnar member is aluminum, and a  
25 material of said tubular molding member is stainless steel.



connecting the overlapping portions of the leading and trailing ends of said film.

25. The method according to claim 24, wherein a releasing agent is coated on an inner surface of said tubular molding member.

26. The method according to claim 24, wherein a thermoplastic sheet film 5 to 300  $\mu\text{m}$  in thickness is wound on said columnar member so that leading and trailing ends of said film partially overlap each other,

said tubular molding member has an inner diameter larger by 15  $\mu\text{m}$  than an outer diameter of said columnar member, and

the overlapping portions of said film are connected by holding at least said film within the temperature range from a melt temperature to a decomposition temperature thereof for a predetermined time.

27. A method of manufacturing a tubular film, comprising the steps of:

winding a first thermoplastic sheet film a plurality of number of times on a columnar member so that leading and trailing ends partially overlap each other;

winding a second thermoplastic sheet film a plurality of number of times on said wound first sheet

film so that leading and trailing ends partially overlap each other;

covering said first and second films with a tubular molding member; and

5 connecting the overlapping portions by heating said first and second films to a temperature, at which the overlapping portions are connected, for a predetermined time, thereby forming a multilayered tubular film.

10 28. The method according to claim 27, further comprising the step of cooling said columnar member, said films, and said tubular molding member after the heating step.

29. A method of manufacturing a tubular film,  
15 comprising the steps of:

winding a thermoplastic sheet film on a columnar member so that leading and trailing ends of said film partially overlap each other;

fitting a thermoplastic tube on said sheet film;

20 fitting a tubular molding member on said thermoplastic tube; and

connecting the overlapping portions by heating at least said sheet film within a temperature range from a melt temperature to a decomposition temperature

25 thereof.

30. The method according to claim 29, further comprising the step of cooling said columnar member, said film, and said tubular molding member after the heating step.

- 5 31. A method of manufacturing a tubular film, comprising the steps of:

fitting a non-thermoplastic tube on a columnar member;

- 10 winding a thermoplastic sheet film on said tube so that leading and trailing ends of said film partially overlap each other;

fitting a tubular molding member on said sheet film; and

- 15 connecting the overlapping portions by heating at least said sheet film within a temperature range from a melt temperature to a decomposition temperature thereof.

- 20 32. The method according to claim 31, further comprising the step of cooling said columnar member, said film, and said tubular molding member after the heating step.

33. A method of manufacturing a tubular film, comprising the steps of:

- 25 fitting a non-thermoplastic first tube on a columnar member;



fitting a thermoplastic second tube on said first tube;

fitting a tubular molding member on said second tube; and

5 connecting the overlapping portions by heating at  
least said sheet film within a temperature range from a  
melt temperature to a decomposition temperature  
thereof.

34. The method according to claim 33, further  
10 comprising the step of cooling said columnar member,  
said film, and said tubular molding member after the  
heating step.

35. An apparatus for manufacturing a tubular film,  
comprising:

15           a columnar member on which a thermoplastic sheet  
film is wound so that leading and trailing ends of said  
film partially overlap each other;

a tubular molding member in which said film wound on said columnar member is fitted; and

20           heating means for heating at least said film,  
          wherein a tubular film is formed by connecting the  
overlapping portions of said film by heating said film  
by said heating means.

36. A film for a fixing device of an image forming  
25 apparatus, wherein said film is formed by thermally  
connecting two ends of a thermoplastic sheet film, and

toner on an image carrier is fixed by pressurizing the toner between said film and a press member.

37. The film according to claim 36, wherein said thermoplastic film consists of a plurality of films,

5 and a multilayered film is formed by connecting leading and trailing end portions of each of said films.

38. A film for a fixing device of an image forming apparatus, wherein said film is a multilayered tubular film formed by connecting two end portions of each of

10 first and second thermoplastic sheet films, and

toner on an image carrier is fixed by pressurizing the toner between said film and a press member.

39. A film for a fixing device of an image forming apparatus, wherein said film is a multilayered tubular

15 film formed by connecting two end portions of a thermoplastic sheet film on an outer or inner surface of a thermoplastic tube, and

toner on an image carrier is fixed by pressurizing the toner between said film and a press member.

20 40. The film according to claim 39, wherein said tube is made from a non-thermoplastic material.

41. A film for a fixing device of an image forming apparatus, wherein said film is a multilayered film formed by combining thermoplastic and non-thermoplastic

25 tubes, and

toner on an image carrier is fixed by pressurizing the toner between said film and a press member.

42. The film according to claim 41, wherein a surface treatment film for preventing offset of the toner is  
5 formed on a surface of said multilayered film in contact with the toner.

43. A fixing device of an image forming apparatus, wherein a tubular film is formed by connecting two end portions of a thermoplastic sheet member, said tubular  
10 film is driven in the form of a closed loop by pressing said film against a press roller, and a carrier which carries toner is inserted between said tubular film and said press roller, thereby fixing the toner.

44. A conveyor belt, wherein a thermoplastic sheet  
15 film is wound into a cylindrical film so that leading and trailing ends of said film overlap each other to form overlapping portions, molding members are arranged on inner and outer circumferential surfaces of said cylindrical film, and said film is formed into a  
20 tubular belt by heating said film and said molding members.

45. A conveyor device for an image forming apparatus, wherein a thermoplastic sheet film is wound into a cylindrical film so that leading and trailing ends of  
25 said film overlap each other to form overlapping portions, molding members are arranged on inner and

102280-1234567

outer circumferential surfaces of said cylindrical film, said film is formed into a tubular belt by heating said film and said molding members, and said tubular belt is rotated by a driving roller and a press roller.

46. A fixing device for an image forming apparatus, wherein a thermoplastic sheet film is wound into a cylindrical film so that leading and trailing ends of said film overlap each other to form overlapping portions, molding members are arranged on inner and outer circumferential surfaces of said cylindrical film, said film is formed into a tubular belt by heating said film and said molding members, said tubular belt is rotated by a driving roller and a heating roller, and image fixing is performed by passing an image transfer medium between said heating roller and said tubular belt.

47. A tubular film, wherein a thermoplastic sheet film is wound on a columnar member, leading and trailing ends of said film are butted against each other, a tubular molding member is fitted on said wound film, and the butted portions of said film are connected by heating at least said film, thereby forming said sheet film into a tubular film.

48. The film according to claim 47, wherein a thermal expansion coefficient of said columnar member is larger

than a thermal expansion coefficient of said tubular molding member.

49. The film according to claim 47, wherein when said film is in a molten state in the heated state, a

5 tubular film with an arbitrary thickness is obtained in accordance with a gap between said columnar member and said tubular molding member.

50. The film according to claim 47, wherein said sheet film is formed into a tubular film by winding said

10 sheet film a plurality of number of times.

51. The film according to claim 50, wherein said sheet film is wound a plurality of number of times, and the leading and trailing ends of said film are butted against each other to form a wound body.

15 52. The film according to claim 47, wherein the butted portions formed when the two ends of said film are butted against each other coil on a surface of said tubular film.

53. The film according to claim 47, wherein when the 20 two ends of said film are obliquely cut and butted against each other to form a tubular film, the butted portions are spirally formed.

54. The film according to claim 47, wherein when said film is wound once, the butted end faces contact each 25 other along the entire circumference.

100-300-10000

55. The film according to claim 47, wherein an angle which the butted end faces form with a film surface is 90°.

56. The film according to claim 47, wherein an angle  
5 which the butted end faces form with a film surface is other than 90°.

57. The film according to claim 47, wherein said sheet film is made from at least one material selected from the group consisting of thermoplastic polyimide,  
10 polyetheretherketone, polyethersulfone, and a fluorine resin.

58. A method of manufacturing a tubular film, comprising the steps of:

winding a thermoplastic sheet film on a columnar  
15 member;

butting leading and trailing ends of said film against each other;

fitting a tubular molding member on said wound film; and

20 connecting the butted portions of said film by heating at least said film, thereby forming said sheet film into a tubular film.

59. The method according to claim 58, wherein a thermal expansion coefficient of said columnar member  
25 is larger than a thermal expansion coefficient of said tubular molding member.

60. The method according to claim 58, wherein when said film is in a molten state in the heated state, a tubular film with an arbitrary thickness is obtained in accordance with a gap between said columnar member and  
5 said tubular molding member.

61. The method according to claim 58, wherein said sheet film is formed into a tubular film by winding said sheet film a plurality of number of times.

62. The film according to claim 61, wherein said sheet  
10 film is wound a plurality of number of times, and the leading and trailing ends of said film are butted against each other to form a wound body.

63. The method according to claim 58, wherein the butted portions formed when the two ends of said film  
15 are butted against each other coil on a surface of said tubular film.

64. The method according to claim 58, wherein when the two ends of said film are obliquely cut and butted against each other to form a tubular film, the butted  
20 portions are spirally formed.

65. The method according to claim 58, wherein when said film is wound once, the butted end faces contact each other along the entire circumference.

66. The method according to claim 58, wherein an angle  
25 which the butted end faces form with a film surface is 90°.

67. The method according to claim 58, wherein an angle which the butted end faces form with a film surface is other than 90°.

68. The method according to claim 58, wherein said  
5 sheet film is made from at least one material selected from the group consisting of thermoplastic polyimide, polyetheretherketone, polyethersulfone, and a fluorine resin.

20250116094200